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ABSTRACT

This paper looks at the low participation rates in computer mediated conferences (CMC) and argues that one of the causes of this may be an incompatibility between students' learning styles and the style adopted by CMC. Curry's Onion Model provides a well-established framework within which to view the main learning style theories (Riding and Rayner, 1998). The outer layer of Curry's model examines instructional preference. This layer is considered to be most observable, least stable, and most easily influenced. The middle layer of Curry's model concerns an individual's intellectual approach to assimilating information and encompasses many of the learning style theories that are currently popular. This layer is considered to be more stable than the outer layer because it does not directly interact with the environment, although it is modifiable by learning strategies. The inner layer of the model examines cognitive personality style, addressing an individual's approach to adapting and assimilating information, and is considered to be an underlying and relatively permanent personality dimension. The Curry model is used in this paper to review the learning style theories, and it is argued that Riding's Cognitive Styles Analysis is the most powerful theory with which to examine educational CMC. A framework for conducting an empirical investigation using this theory is outlined. (Contains 21 references.) (AEF)

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Learning Style Theory and Computer Mediated Communication

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Abstract This paper looks at the low participation rates in computer mediated conferences (CMC) and argues that one of the causes of this may be an incompatibility between students' learning styles and the style adopted by CMC. The main learning style theories are viewed through the use of Curry's Onion Model. It is argued that Riding's Cognitive Styles Analysis is the most powerful theory with which to examine educational CMC. A framework for conducting an empirical investigation using this theory is outlined.

1 Introduction

Computer mediated communication (CMC) is becoming a popular tool in tertiary education establishments for both distance and campus-based students. Whilst it offers many advantages, especially to distance students, there are concerns about the low levels of active participation in conferences (Little & Light 1999). Indeed, Mason (1994) proposes the 'thirds theory', which suggests that students fall into three distinct groups: those who actively participate, those who read messages but do not participate and those who take no part. More recently, the experience of many tutors, including the authors, is that participation levels are often much lower even than Mason's estimates (Hewitt and Teplovs 1999).

Reasons for the low participation may relate to the subject matter and the approach of the individual or their learning style. For example, Romiszowski & Ravitz (1997) question whether CMC, which is primarily text-based, is equally suited for various subject matters, whilst Kaye (1989) notes that the pedagogic value of computer-based collaboration depends on *"the educational perspective adopted, the nature of the specific discipline and the characteristics of the learners"*. It is the last of these factors with which the research reported in this paper is concerned.

Each individual responds differently to a learning situation. This response will be influenced by the way the individual thinks, their past experience, the demands of the environment and the current task. This approach is generally recognised as the individual's learning style. A successful learner will be able to adapt his or her approach to meet the needs of any task, but not all learners will have developed this skill. The ability to adapt approaches to learning has led some authors to use the term "learning strategy" rather than "learning style".

CMC is essentially a medium of written discourse. Individuals with an incompatible learning style, who are unable to adapt, may find that CMC perpetuates the inequity of an education system that discriminates against students who talk and listen better than they read and write, disadvantaging the less-verbal students. (Light & Light 1999, Rimmershaw 1999, Mason 1994)

Visual versus Verbal style preferences are one of many learning style theories discussed in the literature. During the last century there have been many investigations into style; these have often been conducted in isolation and have given rise to a large number of different style labels. Curry (1983) proposed the 'Onion' model to group the main types of styles, which she suggested could be grouped into three levels resembling the layers of an onion:

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"By this organisation learning behaviour is fundamentally controlled by the central personality dimension, translated through the middle strata information processing dimensions and, given a final twist by interaction with environmental factors encountered in the outer strata."

2 Main Learning Style Theories Viewed Through Curry's Onion Model

Curry's Onion Model provides a well established framework within which to view the main learning style theories (Riding & Rayner 1998). Here we use the model to review these theories and hence to determine the most powerful theory with which to examine educational CMC.

Using CMC requires students to work in a predominantly text-based, somewhat hierarchical environment, which may present them with little or no information, or alternatively proffer vast amounts of information, according to the responses of other users. Although responses are written, the atmosphere is usually fairly informal and often relatively unstructured compared to a classroom. If the conference is asynchronous there may be a long wait for a response. On the other hand, if the discussion is synchronous, everyone may try to 'talk' at the same time leading to confusion. This is the context, then, in which we need to consider the suitability of the various learning style theories.

2.1 Outer Layer – Instructional Preference

The outer layer of Curry's model examines instructional preference. This layer is considered to be most observable, least stable and most easily influenced. Influences include learning environments, learner expectations, teacher expectations and other external features (Curry 1983).

The main theory of instructional preference is proposed by Dunn & Dunn (1978), who believe that learning style reflects the manner in which elements of five basic stimuli affect an individual's ability to perceive, interact with and respond to the learning environment. These are:

- *Environmental*: noise level, light, temperature and class design
- *Emotional*: motivation, persistence, responsibility and structure
- *Sociological*: learning groups, presence of authority figures, learning in varied ways
- *Physiological*: perceptual, intake, time and mobility
- *Psychological*: global v analytic, impulsive v reflective, hemispheric domination

Dunn & Dunn's theory, then, is concerned with stimuli that affect learning. However, although this may provide useful information to individual students in online education some of the stimuli cannot be controlled. Indeed, it has been proposed that the whole concept of a single common learning environment needs to be re-examined in a CMC context, as each individual may be working in a different environment. (Benigno & Trentin 2000) Some of the stimuli will still be relevant, but it is felt that as this level can be easily influenced, advice from the tutor and peers could overcome problems encountered in this area. It is not therefore seen as a fundamentally important theory from the perspective of improving educational CMC.

2.2 Middle Layer – Information Processing Style

The middle layer of Curry's model concerns an individual's intellectual approach to assimilating information (Curry 1983) and encompasses many of the learning style theories currently popular. This layer is considered to be more stable than the outer layer because it does not directly interact with the environment, although it is modifiable by learning strategies. Five main theories fall into this layer.

Kolb (1984) offers an experiential learning cycle, based on the learning models of Lewin, Dewey and Piaget. There are claimed to be four modes of experiential learning based on the cycle, which are presented on a two-axis grid. The horizontal axis runs between active experimentation and reflective observation whilst the vertical axis runs between abstract conceptualisation and concrete experience. The four quadrants are used to identify different types of learners: converger, accommodator, diverger and assimilator. Kolb's model has been used

regularly since it was introduced and has led to the development of further models such as Honey & Mumford's LSQ and McCarthy's 4MAT system (discussed below).

The Honey & Mumford model (Honey & Mumford 1992) was developed from Kolb for use in commerce. It is intended to explore the implications of learning style for management and is often used in training situations and to strengthen teamwork. Like Kolb, it is based on a learning cycle and offers four learning styles: activist, theorist, pragmatist and reflector.

McCarthy's 4MAT system (McCarthy 1997) is also based around a four stage learning cycle and offers four learning styles: innovative, analytic, common sense and dynamic. Unlike the other theorists, McCarthy does not provide an assessment tool, instead advocating that every lesson should provide students of all styles with a preferred task for both left and right brain.

Gregorc (1982) proposes that people differ in the way they organise space and time. Individuals are seen as having two significant types of mediation abilities: perception (the way in which information is grasped) and ordering (the way in which the information is arranged, systemised and deposited). Perception has two qualities: abstractness and concreteness. Ordering has two dimensions: sequential and random. As with Kolb, these dimensions combine to provide four learning styles: concrete sequential, concrete random, abstract sequential and abstract random.

Gardener (1993) suggests that each individual has seven distinct areas of intelligence: linguistic, logical-mathematical, musical, bodily kinesthetic, spatial, interpersonal and intrapersonal. Gardener believes that an individual's abilities will differ in each area as will their learning style.

With the exception of the 4MAT system, all learning style theories at the middle layer of Curry's model provide some form of inventory that could be used to study educational CMC. The dialectically opposed modes offered by Kolb (1984), Honey & Mumford (1992) and Gregorc (1982) could all provide interesting insights into contrasting approaches to conferencing. However, we argue that the differences revealed by these modes may be apparent only in extreme cases, and will be difficult to discern in individuals with a more rounded learning style (Atkins 2000). Similarly, although Gardener's multiple intelligences theory (Gardener 1993) may help to provide an insight into the effect of subject matter on the response to computer conferencing, it is not seen as addressing learning style in a way that would aid our current research (Atkins 2000).

In sum, while all the theories in this layer could provide an insight into approaches to CMC, all fail to examine the verbal-visual modality, which is felt to be an important aspect of learning style when looking at a medium that is predominantly text based.

2.3 Inner Layer – Cognitive Personality Style

The inner layer of Curry's model examines cognitive personality style, addressing an individual's approach to adapting and assimilating information. (Curry 1983). This layer is considered to be an underlying and relatively permanent personality dimension. Five main theories fall into this category.

The Felder and Silverman Learning Style Model (Felder 2000) overlaps the middle and inner layers, classifying students on five spectrums: sensing/intuitive, visual/verbal, inductive/deductive, active/reflective, and sequential/global. Although students are classified on five spectrums, the assessment tool only provides a profile over four, omitting inductive/deductive. It is not clear why this is the case. Further, although it may eventually be able to provide a good profile of learners, Felder & Silverman's model is still under development and has no empirical evidence to support it.

Witkin (Witkin & Goodenough 1982) offers the theory of field-dependence and field-independence, based on an individual's ability to extract details from a context. The Rod and Frame Test and the Embedded Figures Test are used to provide a means of assessment for this theory. This approach is currently being used to investigate learning via hypermedia systems (Kim 2000). However, doubts have been expressed about the validity of both the style and the embedded field test. (Riding & Rayner 1998, Sternberg 1997). In particular, the approach has been criticised by Sternberg (1997) on the grounds that the tests have correct and incorrect answers, and that field-independence is seen as preferable to field-dependence, suggesting that the approach is related more to ability than style.

The Myers-Briggs Type Indicator (MBTI) (Association for Psychological Type 2000) is based on Karl Jung's theory of psychological types. Preferences in the four dimensions of: extraversion/ introversion, sensing/ intuition, thinking/feeling, and judging/perceiving, are used to characterise people according to sixteen types. Work is already being in progress using the MBTI to relate personality type to performance in CMC (Ahn & Ahn 2000). Kiersey develops two questionnaires, the Kiersey Temperament Sorter and the Kiersey Character Sorter, aimed at assessing temperament using different methods. (Kiersey 2000) These are broadly similar (approximately .75 correlation) to the Myers-Briggs Type Indicator. As in the MBTI Kiersey uses four temperaments and sixteen variants. However, both the Myers-Briggs Type Indicator and the Kiersey instruments examine personality types rather than learning styles. Although these theories are sometimes linked to particular learning styles, their primary use in not in that area.

Finally, Riding & Rayner (1998) offer the Cognitive Styles Analysis (CSA), developed as a result of their research on style differences in learning and behaviour. Over 30 style labels were reviewed, including some of the theories reviewed above. Riding and Rayner believe that style is divided into two dimensions: wholist-analytic (the way in which an individual would organise information - in parts or as a whole) and verbal-imagery (the way in which an individual would represent knowledge - in mental pictures or words). This verbal-imagery dimension which would appear to be highly relevant to CMC, given the latter's predominantly text-based nature. Further, the model has been developed for electronic use, has been in use for a number of years and has considerable empirical evidence.

In sum, two models, namely those of Felder & Silverman and Riding & Rayner, offer an investigation of an individual's preferences on the verbal-visual dimension that appears the most likely to affect CMC. Felder & Silverman examine four dimensions, which would give a broader picture than the two dimensions examined by Riding & Rayner. However, given the lack of empirical evidence to support Felder & Silverman's model, we argue that the CSA is currently the best model to use to examine the effects of learning style in a CMC environment.

3 A Framework for Empirical Investigation of Learning Style and CMC.

Our argument is, then, that the CSA should be used to empirically investigate the influence of learning styles on the effective use of educational computer conferencing. Much of the current use of, and interest in, CMC involves higher education, not least because of the growing economic pressures in that sector (Skillcorn 1996). Consequently, we propose an investigation of undergraduate study as a useful starting point for such an empirical study, using the following framework.

We begin by giving the target groups basic instruction in the use of text-based computer conferencing. Next we ask them to complete the Cognitive Styles Analysis which will determine their preferred learning style according to the CSA model and an attitudinal survey regarding their prior experience and attitudes to group work and CMC. Half of the sample is then asked to work on a time-constrained collaborative exercise using computer conferencing and given a similar exercise to work on in a face-to-face context at a later date. The other half of the sample participates in the exercises in reverse order i.e. face-to-face followed by CMC. This is an attempt to counteract the learning effect inherent in conducting two similar exercises.

Data is collected in a number of ways. An attitudinal survey at the end of each session obtains the students' reactions to the exercises. The face-to-face sessions are taped. Records of the CMC sessions are obtained from the computer. Statistical and qualitative analysis can then be used to evaluate the contribution of individual students in each situation, and results viewed in conjunction with the attitudinal surveys and learning style profiles.

We are currently putting this framework into practice with computing undergraduates. A later study will carry out a similar exercise with a comparable group of students from a different discipline, to investigate the possible effects of domain of study. A subsequent cross-sectional study will be undertaken to examine the possibility that maturation may alter the results. We also propose to conduct similar investigations with distance learning students.

4 Summary

It has been noted that often less than one third of students actively take part in a computer conference, and we have argued that this disappointingly low level of activity may be due, in part, to a mismatch between the presentation of CMC and the individual's learning style. Using Curry's Onion Model the main learning style theories have been reviewed and discussed. Whilst all of these may have some relevance to CMC, we have argued that Riding & Rayner's Cognitive Styles Analysis (CSA) is the theory that best addresses the issues that are fundamental to the successful use of computer conferencing. Finally, we have specified an approach to the empirical study of learning style theory for CMC.

We believe that the research outlined in this paper will lead to improvements in text-based computer conferencing and more active participation by a much higher percentage of conference members. This in turn should lead to important gains in the acceptability and usefulness of Computer Mediated Conferencing.

5 References

Ahn J, **Ahn** M. (2000) The relationship between learners' personality types to their performance in computer-mediated distance education. In: *Proceedings of ED-MEDIA 2000* 26 June-1 July, Montreal, Canada. Charlottesville, VA, AACE.

Association for Psychological Type (2000) *What is the Myers-Briggs Type Indicator?* Available from <209.224.198.54/aptmbtiw.htm> [Accessed on 6/4/00].

Atkins H. (2000) *Selecting the most appropriate model for an investigation into the influence of learning style on the effective use of text-based computer conferencing.* Internal Technical Report, Leeds Metropolitan University.

Benigno V., **Trentin** G. (2000) The Evaluation of Online Courses. *Journal of Computer Assisted Learning* (2000) 16, 259-270.

Curry L. (1983) An Organisation of Learning Styles Theory and Constructs. *ERIC Document* 235 185.

Dunn R., **Dunn** K. (1978) *Teaching Students Through Their Individual Learning Styles: A Practical Approach.* Virginia, Reston Publishing

Felder R.M. (2000) Index *of Learning Styles (ILS).* Available from <www2.ncsu.edu/unity/lockers/users/f/felder/public/ILSpage.html> [Accessed on 25/07/00].

Gardner H. (1993) *Frames of Mind: The Theory of Multiple Intelligences.* 2nd Ed. London, Fontana.

Gregorc A.R. (1982) *Style Delineator.* Maynard MA, Gabriel Systems.

Hewitt J., **Teplovs** C. (1999). An Analysis of Growth Patterns in Computer Conferencing. In Hoadley C. (ed.) (1999) *Computer Support for Collaborative Learning* (CSCL '99) Stanford University, Palo Alto, December 11-15 1999.

Honey P., **Mumford** A. (1992) *The Manual of Learning Styles* 3rd Ed. Maidenhead, Peter Honey.

Kaye A. (1989) Computer-mediated communication and distance education. In: **Mason** R., **Kaye** A. (Eds.) (1989) *Mindweave: Communication, Computers & Distance Education.* Oxford, Pergamon Press. Available from <www-icdl.open.ac.uk/mindweave/ mindweave.html>

Keirsey D.M. (2000) *Kiersey Temperament.* Available from <www.kiersey.com/> accessed 22/2/00 and <kiersey.com/faq.html> [Accessed on 6/4/00].

Kim K.S. (2000) Effects of Cognitive Style on Web Search and Navigation. In: *Proceedings of ED-MEDIA 2000* 26 June-1 July, Montreal, Canada. Charlottesville, VA, AACE.

Kolb D.A. (1984) *Experiential Learning: experience as the source of learning and development.* New Jersey, Prentice Hall.

Light P., **Light** V. (1999) Analysing asynchronous learning interactions: computer-mediated communication in a conventional undergraduate setting. In: **Littleton** K., **Light** P. (Eds.) (1999) *Learning with Computers: Analysing productive interaction.* Routledge

Mason R. (1994) *Using Communications Media in Open and Flexible Learning.* London, Kogan Page.

McCarthy B. (1997) A Tale of Four Learners: 4MAT's Learning Styles *Educational Leadership,* March 01 1997

Riding R., **Rayner** S. (1998) *Cognitive Styles and Learning Strategies: Understanding Style Differences in Learning and Behaviour.* London, David Fulton.

Rimmershaw. R. (1999) Using conferencing to support a culture of collaborative study. *Journal of Computer Assisted Learning.* 15. 189-200.

Romiszowski A.J., **Ravitz** J. (1997) Computer Mediated Communication. In: **Dills** C.R., **Romiszowski** A.J (Eds.) (1997) *Instructional Development Paradigms.* New Jersey, Eaglewood Cliffs.

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